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Teaching/Research Project “Wheelmap”

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Abstract*:* In recent years new didactic concepts and approaches have been developed and evaluated at the universities. The concept for cartography lectures presented in this article is based on the close link of research and teaching/learning. The students are involved in all essential steps of a scientific project taking place during a series of lectures – beginning with the development of the scientific issues, followed by the choice and execution of the research methods and finally the presentation of the achieved outcomes. The specific project introduced here is based on self-experiments in which students took the perspective of wheelchair users entrusted with the task to map places, which are accessible for people with impairments. Among others, the goal set for the students was to develop an appropriate concept for the mobile acquisition of data and to visualise the final results by different methods of cartography.

Keywords: Impairments, Wheelmap, Volunteered Geographic Information, Teaching/Research Project, Education

1. “Wheelmap”

With the assistance of the VGI (Volunteered Geographic Information) application “Wheelmap” shown in *Figure 1* users can easily find places all over the world, which are accessible for people with impairments. New places can be entered and evaluated using a simple traffic-light colour scheme.

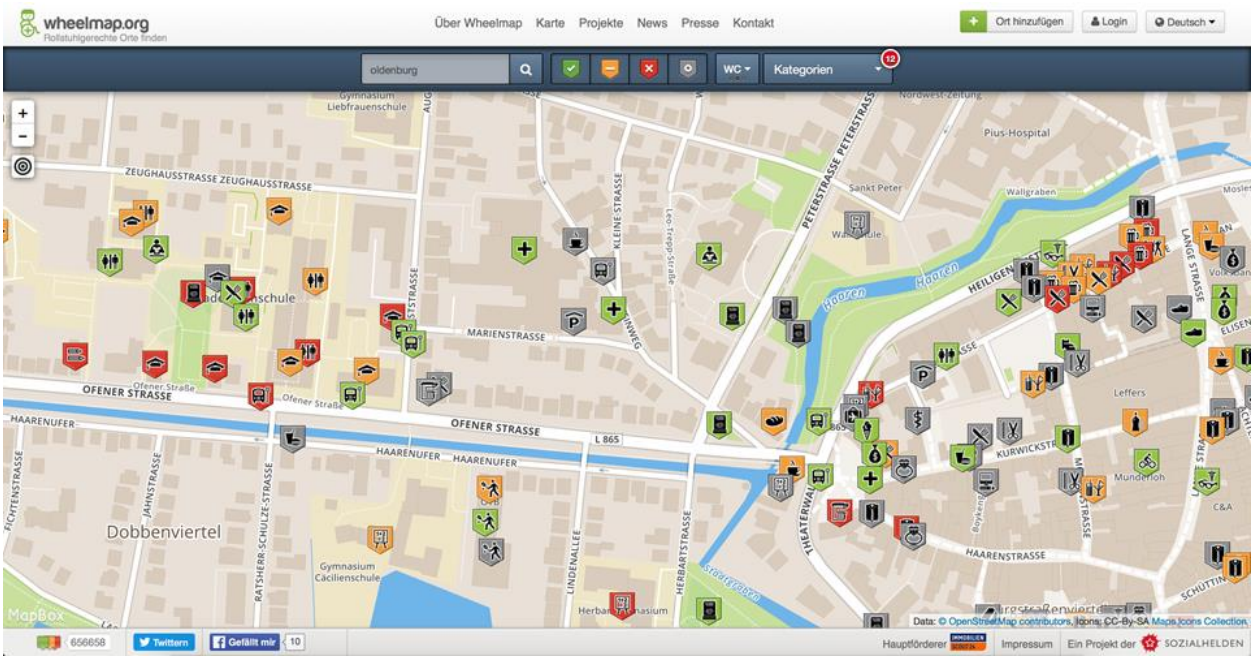

Fig. 1. Project area in Oldenburg, Germany, shown on the “official Wheelmap”. (Source: Wheelmap)

The OSM (Open Street Map) based thematic map helps wheelchair users and people with other mobility limitations with planning their days. Currently more than 730,000 coffee houses, libraries, swimming pools and many other public facilities are documented. Since 2010 this web mapping application is available online. But the "Wheelmap" is also available as a mobile application for smartphones (Wheelmap).

2. "Wheelmap" Experiment

In the course "Cartographic Information Processing" students participating in the Master program "Geodesy and Geoinformatics" at the Jade University of Applied Sciences Wilhelmshaven/Oldenburg/Elsfleth in Germany took the perspective of wheelchair users in self-experiments as shown in *Figure 2*. The goal was to overcome or to drive around existing obstacles on different routes from the university campus to the Oldenburg city centre using borrowed wheelchairs. At the same time missing Places of Interest (POI) were evaluated and added to the "Wheelmap". If necessary, already existing POI were reviewed and updated on the basis of actual information gathered during the trips. An employee of the university, a wheelchair user herself, supported the project with practical advice and accompanied the students in this experiment.

Fig. 2. Students in wheelchairs "exploring" the city of Oldenburg, Germany. (Andreas Gollenstede 2016)

3. Teaching/Research

Schneider and Mustafic (2015) are talking about new didactic concepts and approaches, which have been developed and evaluated with methods of empirical teaching and learning research in recent years.

In cartography related disciplines, such as geography, new didactic concepts are widely being tested – precisely because of its closeness to school teacher training. New methods for working with cartographic media in geography teaching can be found in various publications, for example in Lindau (2012). Further studies at the Jade University will show whether those approaches can be assigned to the practice-oriented cartographic training at universities.

The concept presented here is based on the close combination of research and teaching/learning. Huber (2009) explains the difference between research-based learning and other forms of learning by the fact that the learners are involved in the process of a research project with the focus on gaining new scientific insights, which are also interesting for third parties. The students are involved in all essential phases of such a research project in self-reliant work or by active cooperation in a comprehensive project – beginning with the development of the scientific questions and hypotheses, the choice and execution of the appropriate research methods and the final verification and presentation of the results.

4. Students' Work and Research Packages

The work and research packages identified and structured by the students themselves were divided into three main parts. In the preparation phase a first prototype of a platform independent mobile mapping application was developed using FOSS (Free and Open-Source Software). The main focus of the new app is to capture linear elements like streets and foot paths. These features are actually not included in the "Wheelmap", which is so far just using point features, the POI. The attribution of the new elements is strictly following DIN 18 024/DIN 18 040, which defines requirements on wheelchair accessible trails concerning e.g. surface, width and slope and can be accessed online on e.g. (DIN - Deutsches Institut für Normung e. V.) and (DIN 18040).

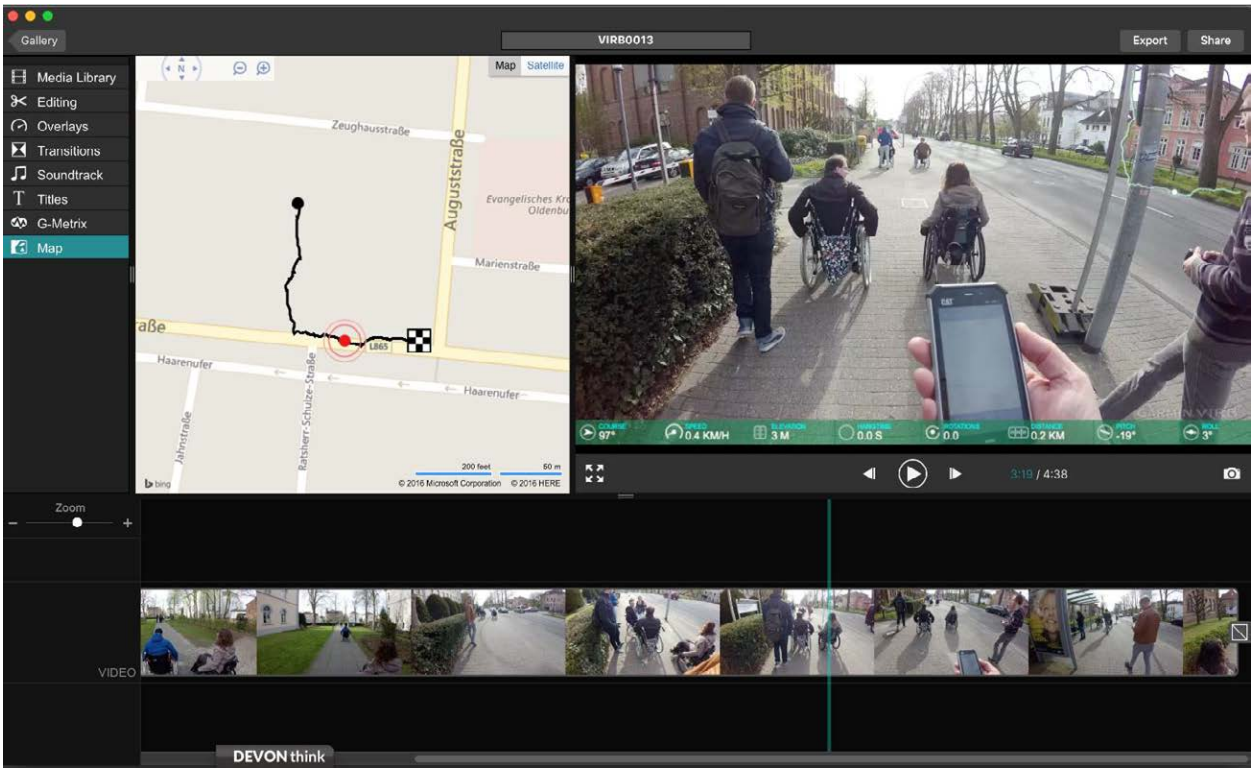

Fig. 3. "Garmin VIRB Edit" software showing the georeferenced video track. (Andreas Gollenstede 2016)

The second step was planning and performing the outdoor part of the experiment. The different wheelchair tracks were documented by action video cameras from different viewing angles. This strategy allowed the students to review the routes again later by assessing the georeferenced video tracks as shown in *Figure 3*. Thus, detail information, which was not registered during the live experiment, could be added later.

The final package was including a cartographic visualisation showing the existing and the newly captured elements. After analysing and evaluating the current "Wheelchair" map, diverse new methods of presentation were compared. One main aspect was to find an appropriate clustering method for the POI combining the traffic-light scheme and the given or even extended categorisation.

5. Conclusion and Outlook

This holistic approach in the context of cartographic education at the Jade University of Applied Sciences was very well accepted by the students. Fundamentally, it covers all steps of the so-called IMAP-principle (Input, Management, Analysis and Presentation) well known from Geographic Information Systems (GIS). Therefore, this was an ideal opportunity for the students to reflect on different aspects of this comprehensive project, such as the various tools used (e.g. web mapping and mobile applications) and the different capturing and presentation methods and last but not least the very dissimilar viewing angles (wheelchair user or non-wheelchair user).

The further development of the mobile client and the mapping application under consideration of empirical usability tests and the cooperation with the main "Wheelmap" project and local inclusion initiatives for people with disabilities in Oldenburg are future steps. Finally, further approaches to similar topics are planned for subsequent semesters in the master program.

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